APPLICATION OF ABDOMINAL CORE RESISTANCE TRAINING IN SOCCER TRAINING

APLICAÇÃO DO TREINAMENTO DO CENTRO ABDOMINAL NO TREINAMENTO DE FUTEBOL

APLICACIÓN DEL ENTRENAMIENTO DEL NÚCLEO ABDOMINAL EN EL ENTRENAMIENTO DE FÚTBOL

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ABSTRACT

Introduction: The abdominal center exercises are essential to ensure functional stability in soccer players, increasing the athlete's safety during rehabilitation. Objective: Verify the practical influence of abdominal core resistance training in the training of soccer players with a history of injuries. Methods: Eighteen athletes with recent sports injuries were selected for a controlled trial, randomly divided into two groups. The athletes underwent an FMS test before the beginning of the experiment. The experimental group underwent resistance training in addition to the usual procedures. The frequency of the intervention was twice weekly and the experiment lasted 12 weeks. All participants were tested and compared by the FMS test after the intervention. A combination of mathematics and statistics was the experiment's effects of the experiment. Results: There was no significant difference in the measurement values of the seven basic tests in the soccer player groups (P>0.05). The fitness level of the experimental group was significantly improved after the abdominal core resistance exercise (P<0.05). Conclusion: Abdominal core stability training can effectively improve the physical fitness of soccer players, reducing the risk of injury. ***Level of evidence II; Therapeutic studies - investigation of treatment outcomes.***

Keywords: *Abdominal Core; Resistance Training; Postural Balance; Soccer.*

RESUMO

Introdução: Os exercícios do centro abdominal são essenciais para garantir a estabilidade funcional nos jogadores de futebol, aumentando a segurança do atleta em reabilitação. Objetivo: Verificar a influência prática do fortalecimento do centro abdominal no treinamento de jogadores de futebol com histórico de lesões. Métodos: Foram selecionados 18 atletas com lesões esportivas recentes para um ensaio controlado, divididos aleatoriamente em dois grupos. Os esportistas passaram por um teste FMS antes do início do experimento. O grupo experimental foi submetido a um treinamento de força, além dos procedimentos habituais. A frequência da intervenção foi de duas vezes semanais e o experimento durou 12 semanas. Todos os participantes foram testados e comparados pelo teste FMS após a intervenção. Foi empregada a combinação de matemática e estatística para comparar os efeitos do experimento. Resultados: Não houve diferença significativa nos valores de medição dos sete testes básicos nos grupos de jogadores de futebol (P>0,05). O nível de aptidão física do grupo experimental foi significativamente aperfeiçoado após o exercício de força do centro abdominal (P<0,05). Conclusão: O treinamento de força do centro abdominal pode efetivamente melhorar a capacidade física dos jogadores de futebol, reduzindo o risco de lesões. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

Descritores: *Centro Abdominal; Treinamento de Força; Equilíbrio Postural; Futebol.*

RESUMEN

Introducción: Los ejercicios del núcleo abdominal son esenciales para garantizar la estabilidad funcional en los futbolistas, aumentando la seguridad del deportista en la rehabilitación. Objetivo: Verificar la influencia práctica del entrenamiento de fuerza del núcleo abdominal en el entrenamiento de futbolistas con antecedentes de lesiones. Métodos: Se seleccionaron dieciocho atletas con lesiones deportivas recientes para un ensayo controlado, divididos aleatoriamente en dos grupos. Los atletas se sometieron a una prueba de FMS antes del comienzo del experimento. El grupo experimental se sometió a un entrenamiento de fuerza además de los procedimientos habituales. La frecuencia de la intervención fue de dos veces por semana y el experimento duró 12 semanas. Todos los participantes fueron evaluados y comparados por la prueba FMS después de la intervención. Se empleó una combinación de matemáticas y estadística para comparar los efectos del experimento. Resultados: No hubo diferencias significativas en los valores de medición de las siete pruebas básicas en los grupos de futbolistas (P>0,05). El nivel de condición física del grupo experimental mejoró significativamente después del ejercicio de fuerza del núcleo abdominal (P<0,05). Conclusión: El entrenamiento de la fuerza del núcleo abdominal puede mejorar eficazmente la aptitud física de los futbolistas, reduciendo el riesgo de lesionez. ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

Descriptores: *Núcleo Abdominal; Entrenamiento de Fuerza; Equilibrio Postural; Fútbol.*

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INTRODUCTION

The characteristics of football against intense and high-intensity sports make sports injuries inevitable in physical education and competition. Once a sports injury occurs, athletes generally take medical and surgical treatment. At the same time, athletes need to reduce exercise intensity or suspend exercise to help athletes recover as soon as possible. However, most of these traditional treatment methods and programs are designed to design a treatment program for the injured area and cannot fundamentally explain the cause of the injury. Many acute and long-term injuries occur in college physical education.[1] All of these have a particular relationship with the reduction of physical fitness of athletes. That's why there are so many injuries near the end of training. Merely treating injuries through medical methods can help the injured area recover, but it cannot compensate for their physical defects. Athletes may experience a decline in physical fitness by reducing training volume or suspending training during treatment.[2] The root cause of injuries to athletes in this condition has not been addressed. Repeated injuries often occur once the athletic ability is restored. This will have a particularly adverse effect on the athlete's body and athletic ability.

Research on core stability training has become a hot topic. This also fully shows that core stability is essential in cultivating core competencies. Core stability is an essential condition for maintaining body balance.[3] The four systems of breathing, muscles, bones, and nerves work together to maintain the balance of the body. Core stability training must be strengthened in football. Core stabilization transmits strength to the upper and lower extremities and maintains the support of the muscles of the extremities. Although Chinese research on core stability has different perspectives, the central idea is the same. Core stability has the function and effect of maintaining the body's stable support. Core stability applied to the actual training of youth football teams can enhance their stability. This will help them adapt better and become more skilled in playing football.[4] Therefore, this paper applies core stability training to football teaching and training. This study aims to test its role in football teaching through comparative experiments.

METHOD

Test objectives

This article selects 18 athletes with sports injuries in 2020 for a comparative test. The subjects were randomly divided into two groups during the experiment. Competitors undergo an FMS test before the trial begins. The players in the experimental group performed core stability training.[5] The frequency is twice a week. The control group did not perform core stabilization exercises.

Test scheme

During the test, players in the experimental group performed core stabilization exercises twice a week, 50 minutes each time. The control group did not perform core stabilization exercises. In core stability training, the core strength training of the experimental group was divided into muscle balance training, core strength training, balance training, and stretching training.[6] The trial lasted 12 weeks. At the end of the 12-week comparative trial, all participating players were tested for FMS. This study uses a combination of mathematics and statistics to compare the effects of experiments.

Visual tracking method for football players

In this paper, the color model of the Bayesian classifier is used first to establish the object's background. Then this paper uses a unified method to divide the three primary color components in the RGB color area into 16 different color areas. This paper's corresponding color histogram is obtained by counting the pixels in different color regions.[7] The statistical area is S. The target player area is C. The background area is R. The current position pixel is x. The color interval to which the pixel at the current position belongs is r_x. The likelihood probability that the pixel x belongs to the target is

$$Y(x \in C \mid C, R, r_x) \approx \frac{Y(r_x \mid x \in C)Y(x \in C)}{Y(r_x \mid x \in C)Y(x \in C) + Y(r_x \mid x \in R)Y(x \in C)} \quad (1)$$

The color histogram in this paper expresses the a priori that the pixel points belong to the object and the background as

$$Y(r_x \mid x \in C) \approx \frac{D_C^S(r_x)}{|C|} \quad (2)$$

$$Y(r_x \mid x \in R) \approx \frac{D_R^S(r_x)}{|R|} \quad (3)$$

$D_R^S(r_x)$ represents the statistics of the r_x color interval in the object color histogram. $D_R^S(r_x)$ represents the statistics of the r_x color interval in the background color histogram. $|C|$ represents the object area. $|R|$ represents the background area. $Y(x \in C)$ and $Y(x \in R)$ can be summed in terms of area ratios.

$$Y(x \in C) \approx \frac{|C|}{|C| + |R|} \quad (4)$$

$$Y(x \in R) \approx \frac{|R|}{|C| + |R|} \quad (5)$$

In this paper, formulas (2)-(5) are combined to express formula (1) simply as

$$Y(x \in C \mid C, R, r_x) = \begin{cases} \dfrac{D_C^S(r_x)}{D_C^S(r_x) + D_R^S(r_x)} & r_x \in \{r(C \cup R)\} \\ 0.5 & otherwise \end{cases} \quad (6)$$

There is no need for a code of ethics for this study. $r_x \in \{r(C \cup R)\}$ color separation occurs neither in the target nor in the background nor the background. The color model also cannot tell which color is more biased in which direction from the known possibilities. The probability that pixel x is the target, in this case, is 0.5. This study uses a combination of mathematics and statistics to compare the effects of experiments.[8]

ETHICAL COMPLIANCE

Research experiments conducted in this article with animals or humans were approved by the Ethical Committee and responsible authorities of Department of Sports, Henan Finance University following all guidelines, regulations, legal, and ethical standards as required for humans or animals.

RESULTS

Effect analysis of the FMS test of two football players in the early stage of the test

In the FMS exam, this paper uses the average value of 0-3 to quantify the players' performance. When a person suffers from pain in some part of his body, he scores 0 points. At this time, completing the total game score is impossible. Competitors only take 2 points for completing all the competitions. An athlete who can complete the entire game smoothly and with high quality during the competition is awarded a score of 3. The FMS test data for the first two groups of the trial are shown in Table 1. There were no significant differences in the measured values of the seven basic tests between the two groups before the comparison test.[9] This indicates that the two football players had the same athletic ability and risk factors for sports injury before the comparison test. This can ensure the comparability of the FMS test and the reliability of the test conclusions after the comparison test is completed.

The effect of the two groups of players in the FMS test after the test

The FMS trials' data changed somewhat after the 12-week comparative trial. The seven basic test scores of the two groups of players improved overall, but the degree of improvement was quite different.[10] The experimental group improved more than the control players. (Table 2)

After the test, the two groups of athletes performed squat, trunk regular push-ups, step-ups, straight-leg active lifts, and significant comparisons ($P<0.05$). There was a significant difference in linear lunge performance between the two groups of players ($P<0.01$). The experimental group showed a more significant improvement than the control group.[11] The tests of shoulder flexibility and torsional/rotational stability conducted in this paper found that the measurements of both items were significantly improved over those before the test. There was no significant difference in the measured values of the two items after the test ($P>0.05$). Squats, trunk-stabilizing push-ups, step-ups, straight-leg active lifts, and straight-line lunges are assessments of the athlete's leg movements. The physical fitness of the experimental group after the test, especially in the motor function of the legs, was significantly better than that of the control group.[12] This suggests that applying core stabilization techniques to soccer training can improve student fitness levels and reduce potential dangers.

Table 1. FMS trials of the first two groups of trials.

Test action		Test group	Control group	P value
Squat		1.88 ± 0.36	1.91 ± 0.38	>0.05
Torso Stabilization Push-Ups		1.61 ± 0.43	1.6 ± 0.42	>0.05
Step up				
	Left	1.68 ± 0.62	1.68 ± 0.66	>0.05
	Right	1.75 ± 0.51	1.77 ± 0.6	>0.05
Straight lunge				
	Left	1.82 ± 0.55	1.84 ± 0.54	>0.05
	Right	1.8 ± 0.53	1.79 ± 0.58	>0.05
Shoulder flexibility				
	Left	2.6 ± 0.58	2.62 ± 0.57	>0.05
	Right	2.62 ± 0.51	2.61 ± 0.55	>0.05
Straight leg active lift				
	Left	2.05 ± 0.37	2.07 ± 0.41	>0.05
	Right	2.08 ± 0.42	2.09 ± 0.4	>0.05
Torsion/Rotation Stability	Left	2.05 ± 0.49	2.04 ± 0.44	>0.05
	Right	2 ± 0.53	2.01 ± 0.51	>0.05

Table 2. Data from the FMS test of the two groups of players after the test.

Test action		Test group	Control group	P value
Squat		2.32 ± 0.42	2.04 ± 0.43	<0.05
Torso Stabilization Push-Ups		2.05 ± 0.48	1.77 ± 0.52	<0.05
Step up				
	Left	2.28 ± 0.74	1.85 ± 0.54	<0.05
	Right	2.27 ± 0.62	1.86 ± 0.59	<0.05
Straight lunge				
	Left	2.4 ± 0.57	1.97 ± 0.55	<0.01
	Right	2.37±0.54	1.92 ± 0.6	<0.01
Shoulder flexibility straight				
	Left	2.68 ± 0.55	2.67 ± 0.57	>0.05
	Right	2.69 ± 0.52	2.66 ± 0.59	>0.05
Active leg lift				
	Left	2.45 ± 0.4	2.18 ± 0.42	<0.05
	Right	2.41 ± 0.43	2.12 ± 0.41	<0.05
Torsion/Rotation Stability	Left	2.1 ± 0.40	2.09 ± 0.42	>0.05
	Right	2.15 ± 0.44	2.1 ± 0.46	>0.05

DISCUSSION

Applying core stabilization athletic training to college football can improve athlete fitness. Core stability improves leg movement and reduces injury risk. The principle of stability of the core ability of football is to play a stable role in the movement of the core muscle group.[13] This can improve the technical ability of football players. From a kinematic anatomy perspective, the muscle groups are not the same as the muscles of the torso, waist, and abdomen as previously defined. Core strength exercises that focus on the lumbar spine, pelvis, and glutes involve all muscles. From an anatomical point of view, this is a whole new definition. The physical fitness training of football players must adhere to the basic principle of stability.[14] In football core fitness training, the primary muscle group and the deep small muscles support and connect the upper and lower limbs to exercise appropriately to ensure their effectiveness. The relative stability and balance of the body should be emphasized under the working mechanism of the human body. The focus of a football player is to maintain and maintain balance. Do stretching exercises while doing core stability training. This can fully relax the tensed muscles and soft tissues and reduce muscle fatigue. This exercise can reduce the occurrence of muscle strain and so on. This allows the muscles on both sides of the athlete to be fully balanced.

CONCLUSION

Core stability exercises can improve a player's fitness and reduce the potential risk of injury. This has practical significance for improving the physical exercise of college students. College football teachers and coaches should strengthen the core stability exercise for students in college football teaching. At the same time, coaches need to summarize some useful experience on this basis gradually.

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